

THE CLIMATE OF KANSAS.

On January 8, 1907, in a hearing before the Committee on Agriculture of the House of Representatives at Washington, D. C., Professor Moore was asked certain questions in regard to rainfall and change of climate, which duty required him to answer. The following is a verbatim copy of the stenographic report of his testimony on that date, as published by the committee, and includes every word that was said bearing on rainfall or climate.

Mr. FIELD. With reference to the rainfall there is a question or two I would like to ask. A year or two ago I made inquiry of you with reference to the prevailing idea that in the arid country the rainfall is gradually increasing.

Professor MOORE. That is the popular opinion.

Mr. FIELD. Yes; but the impression in the public mind is such that a great many people may rely on it to their prejudice. Do you think there is to be a recurrence of dry years, just as there has been in the last three years a very perceptible increase in rainfall?

Professor MOORE. I have not any doubt of it. Many people have written to me and have said that they have been advised to buy land in this region now, and that it is two or three times what it was ten years ago in price, but that it is offered for sale to them on the ground that there has been a permanent change in the climate. They say they have had such-and-such rainfall for the past six years, and six years is a long time, and that therefore the climate has changed. I have answered and said no, it has not changed. It is true there has been a period of years in which there has been more than the average rainfall. But do not be deceived, there will come years when it will be just as short as it has been in excess.

We find, right in the arid regions, that during a long period of observations, thirty, forty, or fifty years, the average of the first ten years is precisely the same as the average of the last. I do not mean to say that there has not been a change in the climate on this continent [in geologic periods], for there has been a great change in the climate.

Mr. FIELD. What is the longest cycle of either dry or wet weather?

Professor MOORE. I can not answer that offhand, but my opinion is that the present long period of abundant rainfall over the great cereal plains of this country is the longest we have ever had a record of.

Mr. FIELD. At present?

Professor MOORE. At present; and I as confidently look for as long a period of drought. I think the people ought to take cognizance of that, instead of proceeding on the theory that they are going to have an abundance of rainfall and big crops; they should realize that the time is now coming when we will have to go through a drought and a shortage of crops.

Mr. BROOKS. There is another popular misconception, that while the average rainfall has not increased materially, the distribution has been equalized; for instance, that 13 inches twenty years ago was the result of eight or ten heavy storms, and now it is the result of 50 storms, spread along through fifty weeks. Is there anything in that?

Professor MOORE. Not exactly the way you state it; but there is something in this, that the same amount of rainfall is better conserved, because of better methods of cultivation.

Mr. BROOKS. That goes to the cultural methods?

Professor MOORE. There is one other test. We are breaking up virgin soil and planting trees. While not increasing the rainfall, it will make the same amount more efficient and more profitable, because the soil is broken up and there will not be as much run-off. It is retarded and kept from running off, and there is not so much evaporation. The same amount of rain that you got before is more perfectly absorbed.

Mr. FIELD. That would not make what has heretofore been an arid country a safe agricultural country?

Professor MOORE. No.

The CHAIRMAN. Professor, how many wet seasons have we had, in your judgment, consecutively?

Professor MOORE. Six seasons, from my recollection.

The CHAIRMAN. In that time, as I understand it, Mr. Brooks thinks that dry farming has been built up?

Mr. BROOKS. In four years the dry farming method has come in.

The CHAIRMAN. Suppose we strike a number of dry seasons—I wonder whether we can carry on that dry farming?

Professor MOORE. Probably not in the places where you have attempted it.

The CHAIRMAN. We are inducing a number of people to move into this dry country, and if a dry cycle follows a wet season they will get in trouble.

Mr. HENRY. Mr. Mead¹ made the point on that last year.

Mr. BROOKS. The whole theory of Mr. Mead's work is to me a warning and demonstration of what the limits of successful dry farming are. Its limits are very closely defined. The Department is working along

exactly the line Doctor Moore has now outlined in counteracting this overconfidence.

The CHAIRMAN. It is a land boom.

Mr. BROOKS. Yes.

Professor MOORE. A great many people have bought land, I am very confident, from letters that I have received, in a region which in the majority of years will not be productive.

The CHAIRMAN. Lands that are not commercial propositions?

Professor MOORE. Yes. I have written a number of letters to people who have asked me for advice advising them not to buy anything on the ground that it will be productive unless it was productive ten years ago.

Mr. SCOTT. You stated a while ago that we would not have any rain except for the dust particles in the air.

Professor MOORE. Precisely.

Mr. SCOTT. I presume that implies that the fewer dust particles we have in the air the less rainfall we are likely to have.

Professor MOORE. It may be that it would depend somewhat on the size of the dust particles. That we do not know yet.

Mr. SCOTT. The question I was leading up to is whether, in your judgment, it is possible that the breaking up of this country out in the semi-arid West might perhaps create a sufficiently large quantity of dust particles to make any difference in the rainfall.

Professor MOORE. I should think not. I think the dust particles that come from such action would not enter into this question.

Mr. SCOTT. Another thing. In relation to the winds in the Western States, I will say that I have lived all my life in eastern Kansas, and I know that we do not have the winds there that we did twenty-five years ago.

Professor MOORE. You have more trees to restrict the blow. You do not feel it as much near the ground.

Mr. SCOTT. Another fact in regard to that is this: Dr. Frank H. Snow, of the University of Kansas, has been making a daily weather observation for more than forty years. His wind instruments are on top of the State University, which is on the summit of a hill just about 300 feet above the surrounding country.

Professor MOORE. Yes.

Mr. SCOTT. The university building is quite high, so that if there is a wind he gets a record of it.

Professor MOORE. Where is it located?

Mr. SCOTT. At Lawrence, Kans. He reports that there is very much less wind now than there was forty years ago when he began.

Professor MOORE. We have some records for the last thirty years. I would like to compare that. Sometimes an instrument that is left to work for a long time, and which is not properly lubricated, will show a deficiency in the blowing of the wind, when it is an instrumental fault, so I would want to compare that with our instruments. We take down an instrument once every seven days and replace it with another that we know is thoroughly lubricated, to be sure that there is no defect in the apparatus. I am not saying that he is not right, because of the fact that the trees that have been planted in that region will restrict the blowing of the wind; but I am quite certain that there has been no change in the general high velocity for, say, an altitude of 50, 60, or 100 feet. I am going to lecture in Emporia next week, if I get away from the committee on time, and I would like to ascertain about the Lawrence record.

Mr. SCOTT. I wish you would stop at Lawrence and talk with Doctor Snow.

Mr. COLE. Is there any difference in the mean temperature of the United States now and fifteen years ago?

Professor MOORE. I should say not.

Mr. COLE. There is less snow out in Ohio than there was.

Professor MOORE. No; if you go back to Thomas Jefferson, and he was a pretty good authority in his day, you will find among his papers in the State Department, where he wrote: "It is apparent that the climate of Virginia has changed. The old inhabitants here tell me that they remember when snow lay on the ground four months every year and they rode in sleighs." Now, he says, it is rare that we get enough snow to have a sleigh ride. He said it is apparent the climate of Virginia has changed since 1607, when the settlers came into Jamestown. But it has not changed.

The CHAIRMAN. There might have been some reason. It was a thickly wooded country, was it not?

Professor MOORE. There was a great deal of clearing in that time, but that would not change it. The change was in the man who was telling the story. We measure things by a different standard as we grow older. Every man when he gets to be 50 years of age will look back and think of one great snowstorm, and he will say: "We had snow 4 feet deep all winter long," because all he remembers as he thinks back is the one snowstorm. He remembers the abnormal, and in his mind brings it down to the present day and compares it with the average. But it is not a fair comparison.

Mr. COCKS. Like the blizzard of 1888.

Professor MOORE. Precisely. When you get old enough you will be telling your boys that that occurred every winter.

The CHAIRMAN. We are very much obliged to you, Professor.

The committee (at 3:50) adjourned until to-morrow, Wednesday, January 9, 1907, at 10:30 o'clock a. m.

¹Mr. Elwood Mead, Chief of Irrigation and Drainage Investigation, Office of Experiment Stations, Department of Agriculture.—EDITOR.

It will be seen from the above that not a word was said by Professor Moore about the climate of the State of Kansas. But for some unexplained reason newspapers and correspondents who desired to injure that State, or possibly to injure the reputation of the Weather Bureau, disseminated fraudulent statements regarding this testimony; the blame for thus creating a false impression as to the climate of Kansas must rest upon them and not upon the Chief of the Weather Bureau. Professor Moore adds the following, based upon the official records of observations by the hundreds of observers who have reported to the Weather Bureau, the medical staff of the Army, and the Smithsonian Institution:

It is my duty to publish the simple, ungarnished facts in regard to the climatic conditions of the United States. Our people want the truth so that they may not be misled either by those who honestly, but nevertheless ignorantly, claim that hot winds and droughts will never again come, or by those who, when periods of deficient rainfall occur, as they have in the past and as they certainly will in the future, preach discouragement and the abandoning of lands which, on the average of a long period of years, it would be profitable to cultivate.

I have made a careful examination of the Government records, with a view of putting before those interested in the matter a correct statement regarding the rainfall and wind of both Kansas and Nebraska. These records are made by trained observers and represent the most accurate information that is obtainable. The Government records, as is well known, are in a class separate and distinct from the recollections of the oldest inhabitants.

In the last fifty years records of rainfall in Kansas have been made only in the eastern part of the State. In the western part of the State, which is really the debatable ground, a single record has been made, viz, at Dodge, extending back to 1875. Likewise in Nebraska, the record for North Platte is the only one that extends back to the early seventies. The mean annual rainfall at Dodge for the entire period of observation is 20.8 inches, and at North Platte, 18.7 inches.

Considering the record for the last thirty years only, since it is convenient to subdivide that number into periods of equal length, the mean becomes for Dodge, 21.3 inches, and for North Platte, 19.0 inches. I have also had computed the average rainfall for 3 additional stations in Kansas, 3 in Nebraska, and 1 each in Iowa and Missouri for the last thirty years, to see whether the conclusions reached from a consideration of the Dodge and North Platte data are of local or general application. The averages in periods of ten years each appear in the table below, from which it may be clearly seen that the first and last ten years were periods of fairly abundant rainfall, and that the middle ten years was a period of deficient rainfall. It will be further seen, and this is the important point in the discussion, that there is practically no difference between the rainfall of the first ten years and the last ten years. Three of the ten stations show that the last ten-year period had a slightly greater rainfall than the first, but the difference is so small that it is really immaterial. The remaining stations show a slightly less rainfall in the last ten years than in the first. This table clearly shows, therefore, that the rainfall has neither increased nor diminished by amounts worthy of consideration.

The heavy rains of 1906, and also the year previous, were common to all of that vast stretch of territory west of the ninety-fifth meridian. It was not a local phenomenon centered in western Kansas and western Nebraska, since equally heavy rains fell in Colorado, Utah, western Texas, Oklahoma, New Mexico, Arizona, Nevada, and central and southern California. The explanation of the heavy rains can not be attributed to local conditions of soil and moisture, since, as has just been stated, the heavy rains were common to the arid and mountain regions of the Southwest, where very little agriculture is practised.

Mean rainfall at the stations named.

Stations and periods of observation.	For the full period of observation.	For the 30 years 1877-1906, in periods of 10 years.			
		First.	Second.	Third.	Mean.
	<i>Inches.</i>	<i>Inches.</i>	<i>Inches.</i>	<i>Inches.</i>	<i>Inches.</i>
Dodge, Kans., 1875-1906.....	20.8	22.8	18.4	22.7	21.3
North Platte, Nebr., 1875-1906.....	18.7	20.1	17.2	19.8	19.0
Independence, Kans., 1872-1906.....	37.1	39.1	35.6	38.1	37.6
Genoa, Nebr., 1875-1906.....	28.2	26.3	28.4	31.3	28.0
Manhattan, Kans., 1858-1906.....	30.6	33.4	29.2	31.9	31.5
Lawrence, Kans., 1868-1906.....	36.4	35.1	39.2	35.7	37.0
Omaha, Nebr., 1871-1906.....	30.7	37.6	25.6	27.9	30.4
Minden, Nebr., 1878-1906.....	31.5	36.1	29.2	29.8	31.7
Oregon, Mo., 1866-1906.....	35.6	37.1	32.3	39.5	36.3
Keokuk, Iowa, 1872-1906.....	35.0	35.4	31.4	35.1	34.3

The statement has also been made that the winds are diminishing. An examination of the wind records in Kansas and Nebraska shows that the last fifteen years have not been quite so windy as the fifteen years

previous, and this is especially true of the years 1904, 1905, and 1906. It is not safe to assume, however, that a permanent decrease in the wind velocity has taken place.

As the citizens of Kansas, like those of other States, have learned how to adapt their lives and their agriculture to local climatic conditions, it is very important that correct climatological information be disseminated, so that all citizens may understand exactly what the peculiarities of the local climate are, and be prepared to take advantage of them. To do this the figures given in the preceding table should be quoted and studied, and together with these one should consider the records of sunshine and temperature, for everyone knows that plants and crops can be raised in any climate, and that every region on the globe has its advantages as well as its disadvantages.

WATERSPOUTS IN MARYLAND.

By WILLIAM L. MAYO. Dated Tarrac, Tarrac Province, P. I., December 22, 1906.

Among the valuable articles contained in the MONTHLY WEATHER REVIEW, I have been especially interested in the articles in the July and August numbers of this year telling about the waterspout in Vineyard Sound. Reading the differences of opinion as to whether there were two well-defined spouts or just one in different phases recalls to my mind two waterspouts that I saw a short distance inside the mouth of Chester River, Maryland, Saturday, July 13, 1901. I made a note of them in my diary, but unfortunately neglected to note other conditions at the time. The conditions that I remember distinctly are as follows:

The waterspouts appeared very nearly simultaneously about two o'clock in the afternoon, at the close of a heavy wind and rainstorm that had lasted, with rather unusual force for a summer storm, since very early that morning, and the storm came from the east. I was a member of the State militia at the time, and we had embarked on the yacht *Sylvia* and gone up Chesapeake Bay to Queenstown, Md., where we were to encamp for ten days. A high sea was running from the force of the wind, which blew in heavy puffs and did not draw steadily as our winds from that direction usually do. We had dropt anchor opposite our landing, and were waiting for the small boats to carry us ashore. I was seated at the stern of the vessel when my attention was called by a hollow, roaring sound to a small waterspout moving past, parallel to the east shore of a small island that was about a half-mile from us. While I was watching that, some one said excitedly, "Look at this other waterspout," and on the west side of the island there was another waterspout more than double the size of that on the east side. The smaller one, which was on the east side, began first, and was in action fully three minutes before the second and larger spout on the west side appeared. They were in violent action at the same time for at least five minutes (I make conservative estimates as to the duration of the intervals); then the smaller began to waver in the center of its column, the base half dropt down with a sullen roar, and the upper portion waved a few moments like a streamer and disappeared. The cloud portion of the smaller waterspout began to drift toward the cloud portion of the larger spout, and it looked very much as if the smaller spout was put out of action because its aerial whirl was drawn into the whirl of the larger spout. Before the first spout had quite disappeared, the volume of the second increased rapidly and its rotation became more violent, the cloud bulged downward, and had an ugly, blackish-gray hue. The water was churned into foam and the whole mass dragged itself along for a few minutes more, making a rushing, roaring sound. A small point of land lay in the course of the spout, and when the base reached the shore the column suddenly broke and fell on the point, among the trees. The column of falling water was more than twice as high as the trees, and when the air cleared of the mist there